

# PATENT SPECIFICATION

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726,809



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## COMPLETE SPECIFICATION

### A new or improved Seal for relatively Slidable Members

We, GIRLING LIMITED, a British Company, of Kings Road, Lyseley, Birmingham 11, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a new or improved seal for relatively slidable members such as a piston and cylinder. It is common practice to employ as a seal a ring of natural or synthetic rubber housed in an annular groove in a piston or cylinder, the ring and groove each being of rectangular cross-section and the radial thickness of the ring being slightly greater than the radial depth of the groove.

It has been found that frictional resistance to movement of the piston in the cylinder under low fluid pressures in the cylinder can be considerably reduced by tapering the operative surface of the ring so that it is frusto-conical, the radial thickness of the ring at one end being substantially equal to the radial depth of the groove while at the other end it is greater. A ring of this section however is more expensive to produce than a ring of rectangular cross-section, and it can be assembled in its groove with the lip end facing in the wrong direction.

In a seal employing an elastic ring of which the cross-section is twisted through substantially a right angle so that before assembly the undistorted ring and the groove have substantially the same rectangular shape of radial cross-section but the axial dimension of the ring corresponds to the radial dimension of the groove in which it is received and *vice versa* it has been proposed to make the bottom of the groove slightly oblique with respect to the axis of the cylinder, the radial depth of the groove at one end being less than the radial thickness of the ring, but in that arrangement both end faces of the groove were at right angles to the axis of the cylinder.

According to our invention a seal for relatively slidable members such as a piston and

cylinder comprises a rubber or like ring of rectangular cross-section mounted in an annular groove in the piston or cylinder having a frusto-conical base characterized in that the radial depth of the groove at one end is substantially equal to the radial thickness of the ring, the radial depth at the other end is less than that thickness, and the end face of the groove at the end of greater depth is at right angles, in longitudinal section, to the base of the groove.

The end face of the groove at the end of less depth may be radial or it may be inclined in the opposite direction to the other end face.

As the depth of the groove at one end is less than the radial thickness of the ring the outer surface of the ring, when the ring is fitted into the groove, is frusto-conical and it projects at one end beyond the surface of the piston or cylinder so that when the piston is assembled into the cylinder this end of the ring is compressed radially.

A practical form of our invention as applied to a piston working in an hydraulic cylinder is illustrated by way of example in the accompanying drawing in which:—

Figure 1 is a section of a sealing ring in the free condition.

Figure 2 is a fragmentary longitudinal section of a piston with the sealing ring in position in the groove.

Figure 3 is a fragmentary longitudinal section of the piston in a cylinder showing the form assumed by the sealing ring in use.

In Figure 1 the sealing ring is shown by itself in its free or unstressed condition. It comprises a ring *a* of natural or synthetic rubber of rectangular cross-section.

The piston *b* has machined in it an annular groove *c* to receive the sealing ring. The groove has a frusto-conical base and the radial depth of the groove at one end is substantially equal to the radial thickness of the ring while its depth at the other end is less than that thickness. Thus when the ring is fitted into the

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groove its outer surface is frusto-conical and one end projects beyond the surface of the piston as shown in Figure 2.

When the piston is inserted into an hydraulic cylinder *d* the end of the groove of less depth is next to the end of the piston exposed to the hydraulic pressure which acts in the direction indicated by the arrows in Figure 3.

The end face *e* of the groove at the end of greater depth is at right angles, in longitudinal section, to the base of the groove as shown in Figures 2 and 3 so that it provides a rigid support for the corresponding end of the ring. The other end face *f* may be radial or it may be oppositely inclined to provide at that end of the groove an annular recess into which the adjacent part of the ring is deformed when the piston is inserted into the cylinder as shown in Figure 3.

The groove *c* can readily be machined by using an appropriate form tool.

In an alternative construction the groove *c* instead of being an external groove in the piston may be an internal groove in the cylinder wall, the diameter of the seal ring being increased to suit.

What we claim is:—

1. A seal for relatively slidable members such as a piston and cylinder comprising a rubber or like ring of rectangular cross-section mounted in an annular groove in the piston or cylinder having a frusto-conical base, characterized in that the radial depth of the groove at one end is substantially equal to the radial thickness of the ring, the radial depth at the other end is less than that thickness, and the end face of the groove at the end of greater depth is at right angles, in longitudinal section, to the base of the groove.

2. A seal as claimed in Claim 1 in which the end face of the groove at the end of less radial depth is radial or is inclined in the opposite direction to the other end face.

3. A piston and cylinder assembly incorporating a seal as claimed in Claim 1 or 2 in which the end of the groove of less depth is next to the end of the piston which is exposed to fluid pressure.

4. A seal for relatively slidable members substantially as described with reference to the accompanying drawing.

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#### PROVISIONAL SPECIFICATION

#### A new or improved Seal for relatively Slidable Members

We, GIRLING LIMITED, a British Company, of Kings Road, Tyseley, Birmingham 11, do hereby declare this invention to be described in the following statement:—

This invention relates to a new or improved seal for relatively slidable members such as a piston and cylinder. It is common practice to employ as a seal a ring of natural or synthetic rubber housed in an annular groove in a piston or cylinder, the ring and groove each being of rectangular cross-section and the radial thickness of the ring being slightly greater than the radial depth of the groove.

It has been found that frictional resistance to movement of the piston in the cylinder under low fluid pressures in the cylinder can be considerably reduced by tapering the operative surface of the ring so that it is frusto-conical, the radial thickness of the ring at one end being substantially equal to the radial depth of the groove while at the other end it is greater. A ring of this section however is more expensive to produce than a ring of rectangular cross-section, and it can be assembled in its groove with the lip end facing in the wrong direction.

According to our invention a seal for relatively slidable members such as a piston and cylinder comprises a rubber or like ring of

rectangular cross-section mounted in an annular groove in the piston or cylinder having a frusto-conical base, the radial depth of the groove at one end being substantially equal to the radial thickness of the ring while its depth at the other end is less than the radial thickness of the ring so that when the ring is in position in the groove its outer surface is frusto-conical and it projects at one end beyond the surface of the piston or cylinder.

The end face of the groove at the end of greater depth is preferably at right angles, in longitudinal section, to the base of the groove so that it provides a rigid support for the corresponding end of the ring, while the other end face of the groove may be radial or may be oppositely inclined to provide at that end of the groove an annular recess into which the adjacent part of the ring can be deformed when the piston is inserted into the cylinder.

In an hydraulic cylinder the latter end of the groove will be next to the end of the piston exposed to the hydraulic pressure.

A groove of the required cross-section can be readily machined in a piston or cylinder by using an appropriate form tool.

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FIG. 1.

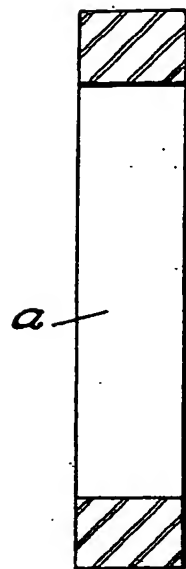


FIG. 2.

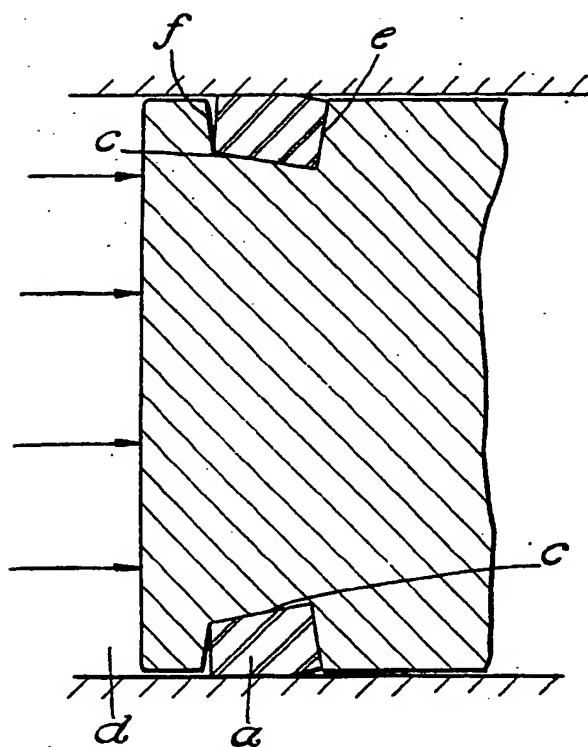
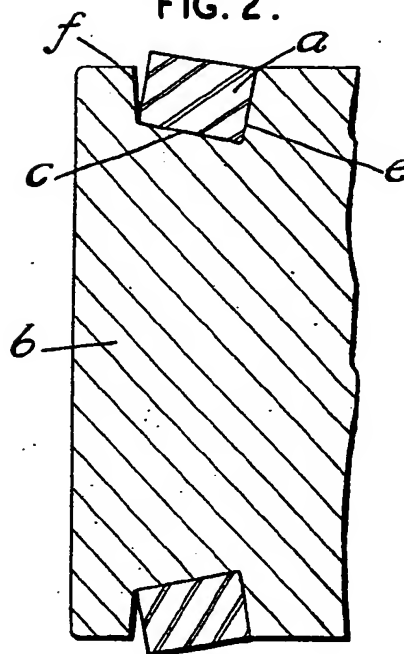


FIG. 3.

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